Learning to Hunt

Hosting a hunting-based outdoor skills event in your community

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Wisconsin
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Credits

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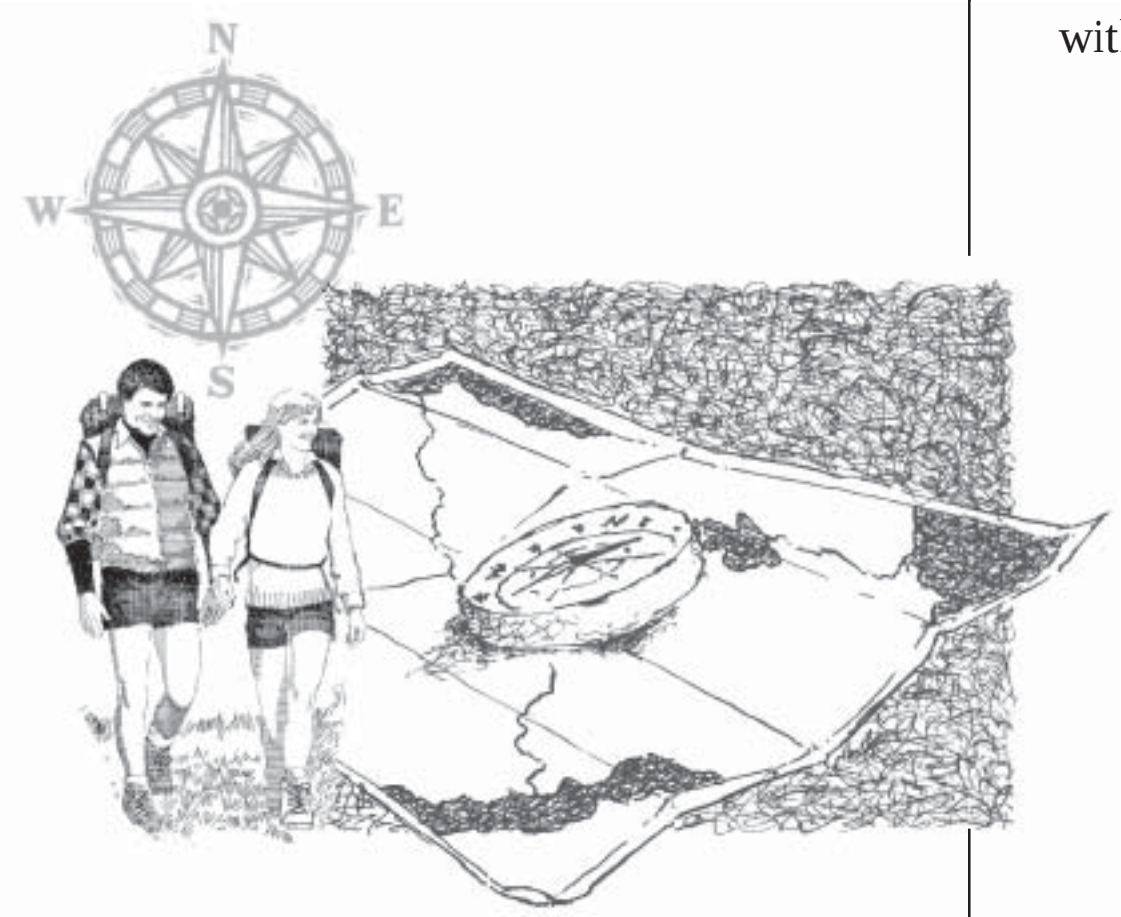
Station 22

Sense of Place

Sense of Place

Using the map and compasss

Participants become familiar with navigating through unknown outdoor territory with the aid of map and compass.



Station
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Sense of Place

Objectives

Participants shall:

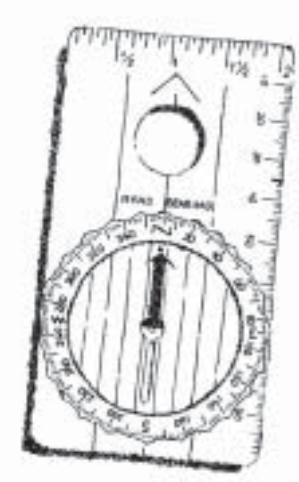
Describe the concepts of symbols, scale, direction, contours, and grid when using topographic maps.

Take a bearing on a landmark.

Demonstrate their ability to use a compass with a map to travel to a prescribed destination.

Demonstrate their ability to use a compass without a map to find their way out of the woods.

Demonstrate proficiency in following an orienteering course.



Equipment

For every pair of participants:

- Silva compass
- Copy of the compass diagram
- Pencils, paper and graph paper
- Stone or other visual marker
- Orienteering Worksheet

For every four participants:

- Irregularly-shaped rock, about 10 inches in diameter
- 3 topographic maps at three scales of the local area (1:24,000, 1:62,500 and 1:250,000)
- Ruler, T-square or long straightedge, plain white paper
- 12-inch length of light string
- Balsa wood sheets and Xacto knife

For every eight participants:

- Galvanized or plastic washtub large enough to submerge the rock
- Grease pencil in a color that is visible on the rock
- Several buckets of water

For the entire group:

- One pair of orange traffic cones or a pair of marker posts
- Several sheets of graph paper, clipboard, and protractor for instructors
- 12 or more station markers which are highly visible in dense vegetation. Examples include fluorescent orange flagging from forestry supply catalogs or orange and white painted 2 x 2 posts.
- 12 paper plates
- Large-nibbed marking pen

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Station Setup

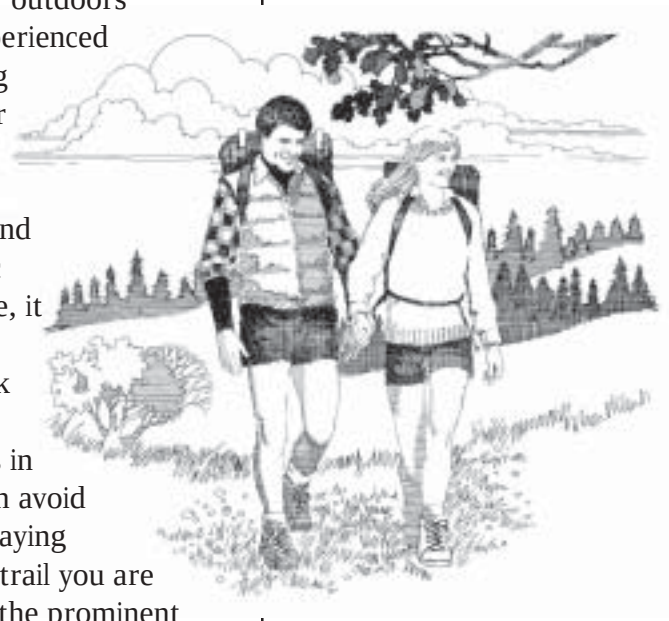
Many of these activities can be accomplished in a classroom setting with access to an outdoor activity area. Review this chapter and set up the various map and compass activities that you would like to accomplish. If you have time to have your participants test their compass skills, then set up an orienteering course as described at the end of this chapter.

For this series of map and compass exercises, you will need U.S. Geological Survey topographic maps for your site at three different scales (1:24,000, 1:62,500 and 1:250,000). You may order maps by contacting the U.S. Geological Survey's Internet site: **www.ask.usgs.gov** or by calling 1-888-275-8747 (ASK-USGS) or by writing:

U.S. Geological Survey
Rocky Mountain Mapping Center
Branch of Information Services
Box 25286
Denver Federal Center
Denver, CO 80225

The USGS also contracts with private-sector business partners in each state who sell topographic maps. Buying from one of these map dealers is usually the fastest way to obtain a USGS topographic map. You may obtain a list of map dealers in your state by contacting the USGS.

Background Information



Getting lost in the woods is an experience that has happened to more than a few outdoors people, even experienced hunters. Getting lost in unfamiliar territory can be not only an uncomfortable and sometimes panic ridden adventure, it can also lead to mishaps that risk your health and life. As hunters in the field, you can avoid getting lost by paying attention to the trail you are on and some of the prominent features you pass along the way. Pay attention to forks in the trail, river crossings and major changes in direction. Remember to look behind you every once in a while, particularly at trail junctions because the view on your return trip will look very different than the view on the trip in. Learn to take it slow, relax and rest to prevent exhaustion from setting in. If you become panicked and exhausted trying to get out of the woods, you soon will not think clearly. Most important, learn how to use a topographic map and compass.

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Activity A

Map basics

Procedure

We use maps in everyday life, particularly road maps. Sometimes we draw our own maps to help friends find our house. Farmers use soil survey maps. City planners create land use maps to show how their community is being used. Geological maps show the structure of the earth's crust, types of rocks and fossils. Topographic maps show the physical and cultural characteristics of an area including elevation, rivers, lakes, marshes, roads, hiking trails and cities.

Topographic maps are the most valuable maps for traveling in the wild. If you are hunting in an unknown or wilderness territory, it is wise to carry a topographic map with you. You should check the map periodically to make certain you know where you are on the landscape. If you have a good topographic map of the area, and if the area has fairly well defined terrain, you can simply look at the map and try to locate the obvious mountain peaks, rivers or other significant landscape features. If you do this periodically along your route, and make note of the significant landscape features you pass, you should usually know where you are at any given point in time.

Hand out topographic maps to your participants. If you have more than one type of map, review the different types and the legends, symbols, scales and directions on the maps. Point out that there are five basic elements to a topographic map—**the 5 "D's": Description, Details, Distance, Directions** and **Designations.**

Description. Each map has its own unique description that tells the map-reader what part of the earth they are interpreting. Have participants look at the top of the map where they will find the map's name. Maps are usually named after a town, lake, mountain or some other major feature in the area covered by the map. The map name can also be found at the bottom of the map, along with its map number. A map number may be something like: AMS 8484

1NW-series V982. Tell participants they will need this number when ordering a map by phone, or they can access the USGS web site and select a map by inserting a zip code.

Along the edges and corners of the map, participants will find names in parentheses. These indicate the names of the maps that border the map they are looking at. Hatch marks and numbers along the top and bottom of the map indicate lines of longitude. Connect these from top to bottom and participants will have meridians that connect the north and south poles. **Longitude lines** run north and south. **Latitude lines** run east and west. Latitude hatch marks and numbers run along the right and left margins of the map. When participants mentally connect these lines, they will have parallels that run parallel to the earth's equator.

The dates provided at the bottom of the map indicate when the aerial photo was taken (e.g., 1995), when the ground-truthing survey was done (field checked in 1996) and when the map was printed or edited (1998). These dates are very important. Maps are only completely accurate for a few years. Beyond that time, landmarks can change significantly. For example, what used to be a quaint rustic rural road in 1970 may be a super highway in the year 2000.

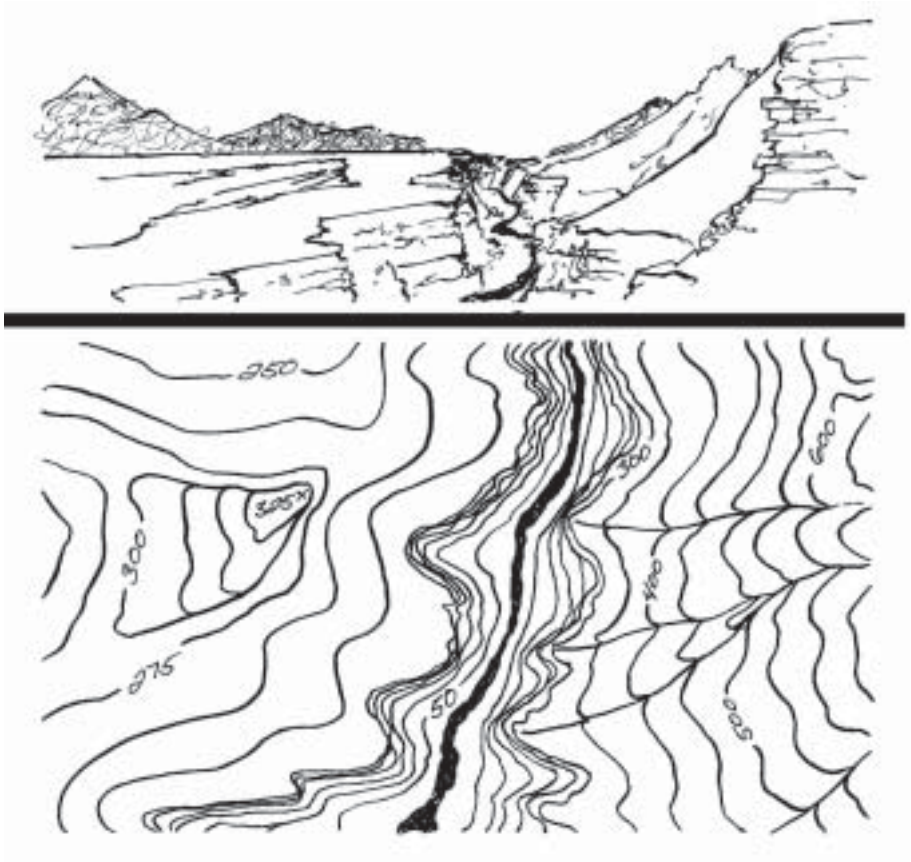
Details. Explain that topographic maps represent, on a vastly reduced scale, a portion of the earth by using symbols to represent natural and artificial structures and contours to show changes in elevation. The landmark details of the landscape on a topographic map are shown or represented as *map symbols.* Symbols are printed in code colors to make interpretation of the map faster and easier. Colors include black, blue, green, brown or red. Typically, symbols in black depict objects built by people such as roads, cities, railroads, bridges, boundaries and place names. Roads shown as two, parallel black lines refer to improved roads, whereas roads shown as two, parallel dashed lines are poorer, unimproved roads. Trails or paths are indicated with a single dashed line. Blackened squares or rectangles indicate buildings. If the square has a flag on top, it represents a school. If it has a cross on top, it symbolizes a church. Primary highways, such as U.S. Highways or Interstates, are symbolized as solid red lines. Secondary highways, such as State highways, are symbolized as red and white dashed lines. Fine red dashed lines indicate fence and field lines where they are visible on aerial photographs of the region.

Woods and wetlands are usually indicated as green areas. Marshes have a blue, "grass-clump" feature drawn in them. A solid blue line

indicates a river or stream. A dashed blue line represents an intermittent stream. Lakes are symbolized as solid blue shapes. White areas on the map represent cleared or cultivated ground, while green areas represent forested ground.

One unique feature of topographic maps is that they show the contours of hills and valleys and the differences in elevation by means of a set of lines called **contour lines**. Contour lines are usually printed in brown on most U.S. Geological Survey topographic maps. A contour line joins places on the map that have the same elevation, for example, 500 feet above sea level. Ask participants to look at the bottom of their map to find the **contour interval** that is the distance in height between one contour line and the one next to it. Lines are spaced farther apart for level land and closer together for steeper slopes. On many topographic maps the contour interval is 20 feet. That means that the elevation changes 20 feet between each brown line on the map. On a map of a rather level area, the contour interval may be as little as 5 feet. In contrast, on maps of mountainous terrain, the contour interval may be 50 feet or more. On such a map of mountain territory, there just wouldn't be enough room on the map for 5-foot or even 20-foot interval lines.

Look at the landscape drawing above the line and discuss how it compares to the map interpretation of that landscape in the diagram below the dark line.



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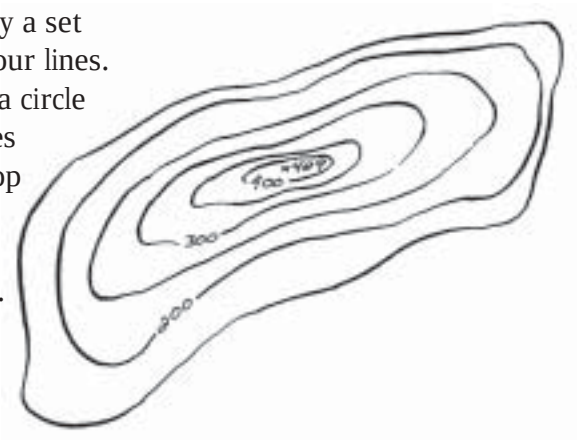
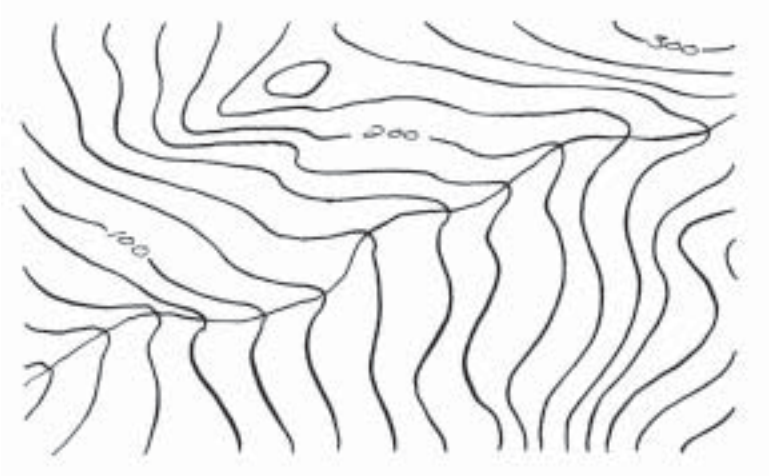
On this topographic map, the contour interval is 20 feet. The darker lines are numbered every 100 feet to make reading the map a little easier.

A **cliff** is indicated by a group of contour lines that converge into one or very few contour lines. By counting the lines converging into a cliff and multiplying by the contour interval, you can determine the height of the cliff. For example, if six lines crowd together on a topographic map which has a 40-foot interval, then the cliff is about 240 feet high.

A **hilltop** is represented by a set of closed, concentric contour lines. The very top of the hill is a circle with no other contour lines inside it. This circle or loop means that it has a higher elevation than the surrounding contour lines.



A **depression** with no drainage outlet is represented by closed, concentric contour lines with hatch marks pointing in the direction of the downward slope. The centermost contour line of a depression, like on a hilltop, is an enclosed circle or loop, but its elevation is lower than all the surrounding contour lines.



A ***streambed*** is represented by contour lines that bend upstream and cross the stream at right angles.

Ask the group to examine their topographic maps to discover what the colors and symbols are used to represent. Have them look for such features as:

- forests
- marshes
- elevation of an area
- depressions, cliffs, sand dunes
- artificial features like roads, railways, houses, churches, schools
- rivers, streams, lakes

Ask the following questions:

- What is the contour interval?
- How can you tell from the contours where there is a steep hillside?
  Answer: Contour lines are closer together
- How can you tell when the land is flat or gently sloping?
  Answer: Contour lines are spaced farther apart
- How can you tell where there is a hilltop?
  Answer: Contour line at the top of the hill makes the smallest circle and the elevation is higher than surrounding area.
- Calculate the difference in elevation between point A and point B on the map.

Distance. Maps are drawn at a variety of scales. The *scale* of a map is the proportion between a distance on the map and the actual distance on the ground. For example, a scale of 1:24,000 means that one centimeter (cm) on the map represents 24,000 cm in the field, or one inch represents 24,000 inches (or 2,000 feet) in the field. Small-scale maps are drawn at a scale of 1:250,000, where one inch equals approximately four miles. These maps cover a lot of territory…between 49 and 68 square miles! On a map drawn to the scale of 1:62,500, one inch is equal to one mile. For general outdoor use, the United States Geological Survey (USGS) topographic maps are considered best. The scale most used for hiking is the 1:24,000 scale or 7.5 minute quadrangle map. This is considered a large-scale map, where the illustrated features are large.

Hand teams of four participants several maps of various scales and ask them to examine the maps. How are they similar, how are they different? Have them look for the difference in detail between 1:24,000, 1:62,500 and 1:250,000 scales. On a 1:24,000 scale map, one inch on the map equals 2,000 feet in the real world. To determine distance using this ratio scale, participants can measure between two points

on the map and multiply by 2,000 to give them the distance in feet. If participants plan to hunt in a small area, less than about 4 miles in radius, then a 7.5-minute series at a 1:24,000 scale is best. Have participants look in the upper right corner of map for the map series number given in minutes. For hunts in larger areas, participants can use a series of neighboring 7.5-minute maps. Or they can choose a 15-minute series map at a scale of 1:62,500 where the number of inches on the map roughly equals the number of miles on the ground.

Now have participants look at the bar scales at the bottom of the 7.5-minute map. The top bar is divided into miles and fractions of a mile. The middle bar is divided into 1000-foot intervals and the bottom bar is a metric scale. To *estimate* the distance from one point on the map to another, have participants use the following **"rule of thumb."** Ask participants to place their thumb on one of the bar scales to see how wide their thumb is. Have them mark point A and point B on the map and, using their thumbs estimate the distance between the two points.

Now ask participants to calculate a more accurate straight-line distance between two points, using the various map bar scales. Have them use a ruler or the edge of a piece of paper to measure the map distance. Then, taking the ruler or the edge of paper and placing it next to a bar scale, they should be able to figure out the real world distance between two points. They can also copy the map's bar

1:250,000 is a small scale map, showing much of the landscape, but little detail.

At a scale of 1:62,500 you can see more roads in towns as well as major elevations.

At a scale of 1:24,000, the map begins to reveal more detail, though the total area covered by the map is smaller.

scale onto the edge of a piece of paper and use the homemade ruler to determine real-world distances between two points on the map.

Next, have them calculate the distance between two points along a curving line such as along a river or winding road. Let them discover how to do this. If participants can't think of a method, then tell them they can place a string along the path on the map, then stretch the string out and measure it against one of the bar scales.

Directions. Have participants hold the map so that the words are right side up. "Up" on the map is equivalent to true, geographic north. Take your teams outside with the 1:24,000 scale maps of your area and point in the direction of north. Ask teams to turn their maps so that north on the map corresponds with north on the surrounding landscape their map is representing. Or, rather than pointing out north to them, have them observe some of the prominent features like roads and buildings around them, and then have them use the corresponding symbols on the map to *orient* the map to their surroundings. The skill of *orienting a map* is essential to successful orienteering.

Point out that the topographic map has a set of lines running north-south, east-west forming a grid. These lines are oriented according to true, geographic north. This *grid* is helpful in orienteering, finding direction and describing specific location. After participants have oriented their map, have them take an imaginary walk on it. With a ruler, imagine a line drawn between two points on the map. Ask participants to describe what they would see if they hiked between the two points. They must refer to the real world equivalent that is symbolized on the map.

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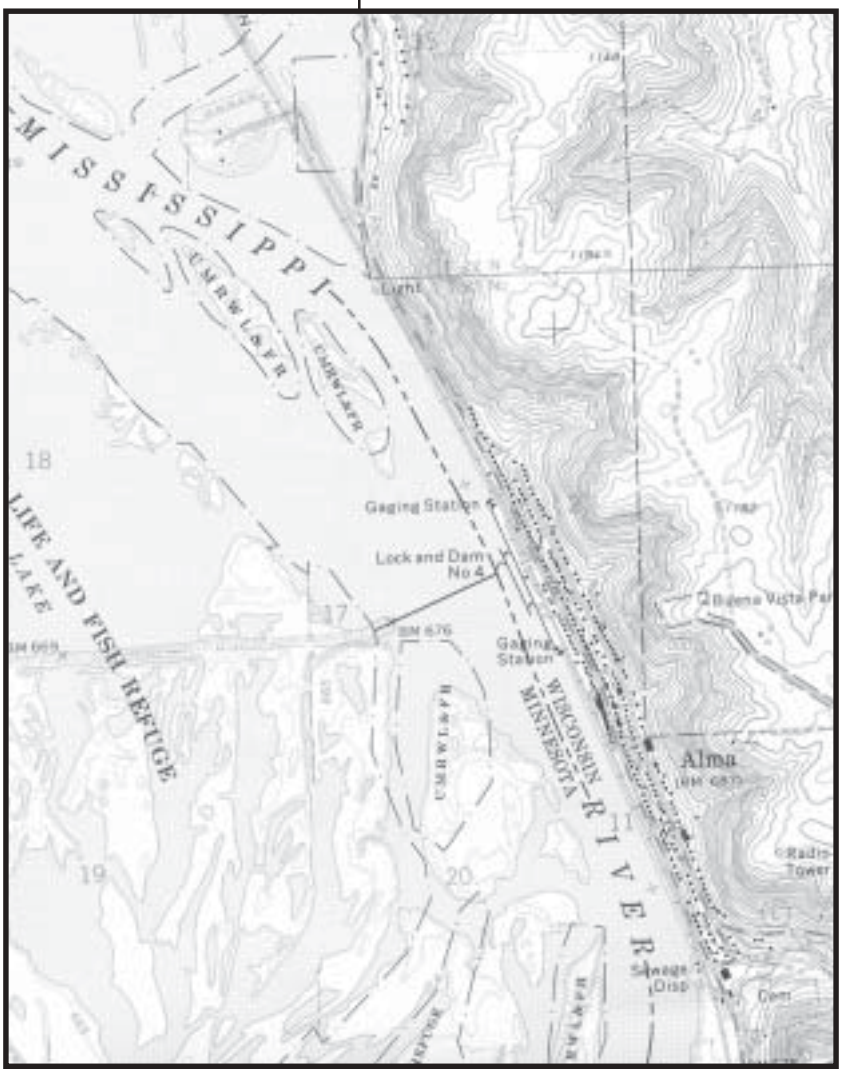
Designations. Different features on the map are designated using different typefaces and font features. For instance, place names and boundary lines are designated with upright Roman typefaces. Water features are designated with slanted italic typefaces. Public works are designated with block letters. Elevations and special descriptive notes are designated with slanted block letters.



Place Names and Boundaries:

Buffalo City
Alma
Nelson

WISCONSIN
MINNESOTA

UPPER MISSISSIPPI RIVER WILD LIFE AND FISH REFUGE

Water Features:

Buffalo River
Iron Creek
Rieck's Lake

Public Works:

Buena Vista Park
Lock and Dam No 4
Gaging Station
Sewage Disp
Radio Tower
Cem
Wayside Park

Elevations and Special Descriptive Notes:

1194

1148

1182

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Sense of Place

Activity B

Map a mountain

Procedure

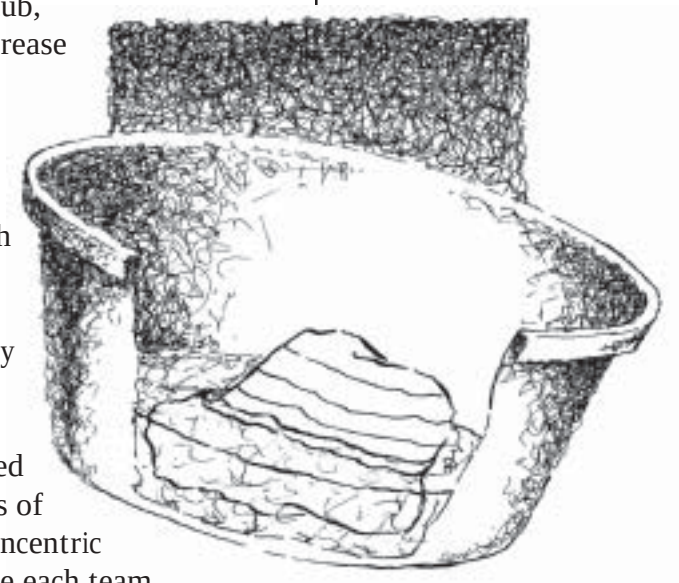
This activity helps demonstrate the concept of contour lines on a topographic map.

Divide your group into teams of four. Give each team one of the rocks. Two teams should be paired at each galvanized or plastic washtub, sharing one grease pencil.

Tell participants they are going to role-play the part of surveyors. Their job will be to map a mountain…an imaginary mountain. Tell them that each of the large, irregularly-shaped rocks represents a Lilliputian mountain. These mountains are places where Lilliputian's from the tale of Gulliver's Travels like to go hunting. Tell them that unlike human surveyors mapping out human-scale mountains, they will not be using transects and other surveyors' tools. Instead, you have another way that will work just fine for mapping their mini mountains.

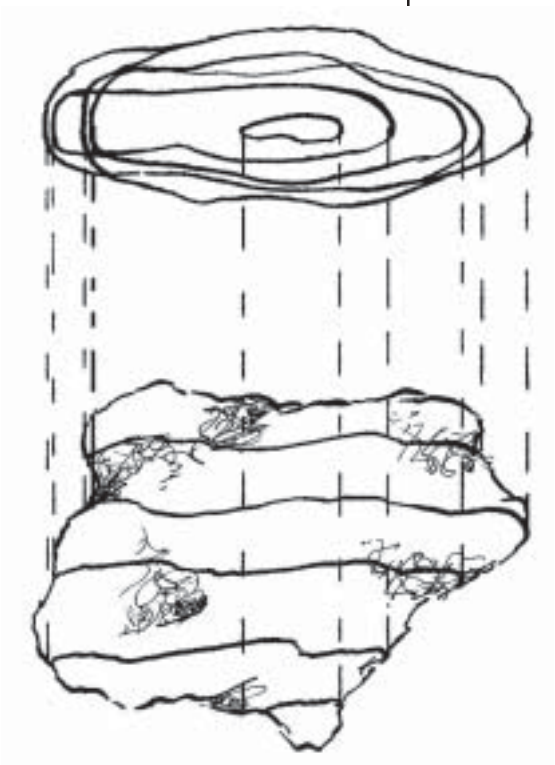
With two teams gathered around their empty washtub, have one team place their "mountain" inside the tub. Ask them to look down at their rock from a bird's-eye view and fill the tub with water until the widest circumference of the rock is reached. Now have them draw a line at that level with a grease pencil. Next, ask them to add more water to raise the water level another inch. They should mark the new waterline on the rock with the grease pencil. Add water to raise the water level another inch and repeat the marking procedure. Continue until the rock is completely submerged.

Now remove the rock from the tub. Empty the tub of water and let the second team work with their rock, tub, water and grease pencil.



After all teams have finished with the rock-marking process, they should each have a rock fully inscribed with a series of irregular, concentric circles. Have each team member take turns looking down on their Lilliputian Mountain and draw its outline and the various waterlines on a piece of graph paper. The completed drawings represent the contour maps of the various Lilliputian Mountains, ready for Lilliputian hunters to take with them as they navigate

through the rough crags and valleys of their mountain in search of wild Lilliputian bighorns. Point out how the contour maps are a two-dimensional representation of a three-dimensional object. In this instance, the contour interval is one inch.



Now have each team place their rocks on a table. Collect all the maps, shuffle them, hand them to the participants and ask the participants to try to find the rock their map represents.

Another good visual aid to explain the meaning of contour lines is to take sheets of balsa wood and cut out successively smaller shapes that stack upon each other in the shape of a mountain. Your participants, working in groups, can take their "balsa mountains" apart. Have them lay the largest piece of wood on a sheet of paper. Trace around this layer. Then, take the next-to-largest layer and trace around it, keeping it within the boundary of the earlier layer. Continue tracing around each layer until the final top layer is placed inside all the other tracings. This should give a great visual demonstration of contour lines.

Top View of Balsam Wood Mountain *Exploded Side View* *Contour Map*

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Activity C

Compass basics

Procedure

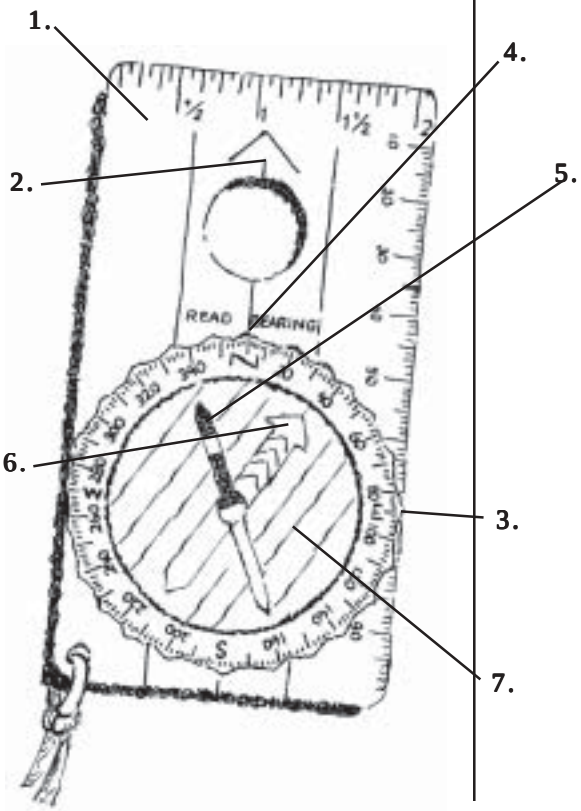
Provide each pair of participants with a Silva compass. Explain that a compass is a tool that helps people navigate in remote areas. The compass unit contains a strip of magnetized steel, balanced on a pivot and is free to swing in any direction. When it comes to rest, the needle always points to magnetic north. Make copies of the compass diagram, hand these out to your participants and discuss the parts and functions of the compass.

1. Base plate—The flat square piece that makes up the foundation of the compass. The base plate has a rule along the top and side edge that is used for determining distances on maps. Scales are in inches along the short axis and in millimeters along the long axis.

2. Direction of travel (DOT) arrow—An arrow drawn on the base plate. Participants should always point this arrow directly away from them when holding a compass, because it represents the direction the individual should travel once that person has properly oriented the compass.

3. Compass dial—Along the perimeter of the circular part of the compass (the part that houses the needle) are numbers corresponding to positions along a 360° circle, measured in degrees, these positions are called bearings. A ***bearing*** is the horizontal direction of one point with respect to another. Each solid white line or dash represents 2°. Each space between the dashes is equal to 1°.

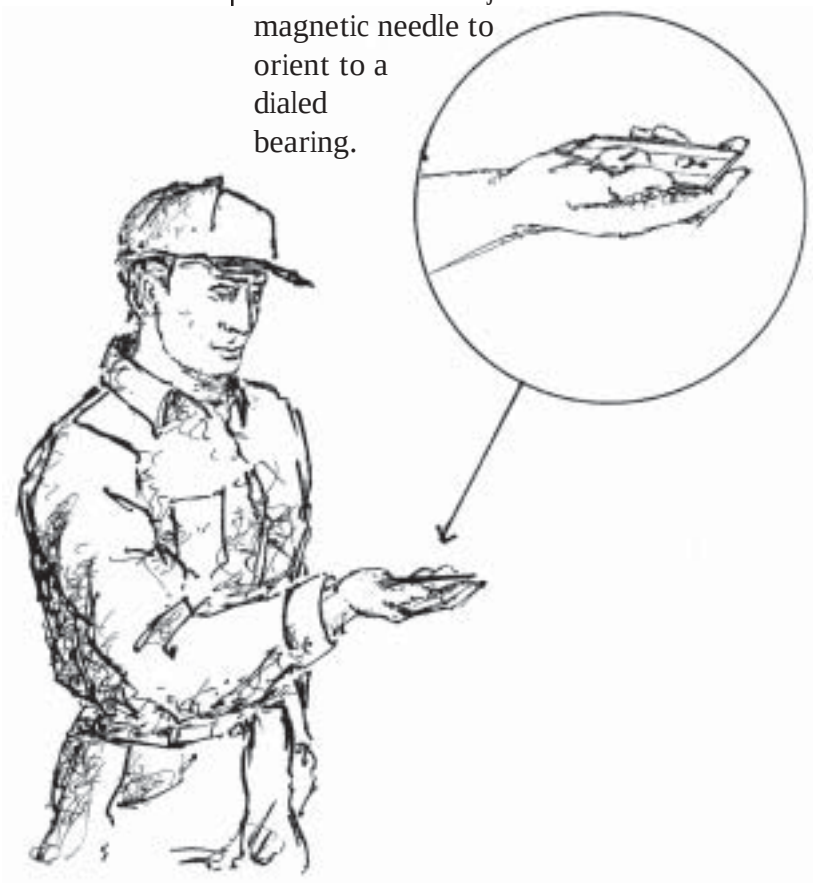
4. Index mark—A small white line that is directly below and in line with the direction of travel arrow, and which remains stationary when the compass dial is turned. This is the reference marker at which the desired bearing is dialed. For example, to



dial a bearing of 20°, turn the compass dial until the number 20 aligns with the index marker.

5. Floating magnetic needle—The red and white needle inside the compass dial that pivots freely and always points to magnetic north, no matter which way the compass is positioned. Caution: The magnetic needle responds readily to nearby metal objects such as cars, skillets, belt buckles, and keys. Avoid contact with metal objects when using a compass to navigate.

6. Orienting arrow—The fat arrow inside the compass housing. This is used in conjunction with the magnetic needle to orient to a dialed bearing.



7. Orienting lines—The thin lines drawn inside the compass housing which are parallel to the orienting arrow. They are used in orienting with the north-south grid lines on topographic maps.

Holding the Compass

Always hold a compass so that the direction of travel arrow points directly away from your front, about waist high and about a foot away from your body. It is also important to hold the compass in the palm of your right or left hand level with the ground and along the vertical centerline of the body. This way you need only look straight down to see your compass.

Demonstrate to participants the correct way of holding a compass and then let them try.

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Activity D

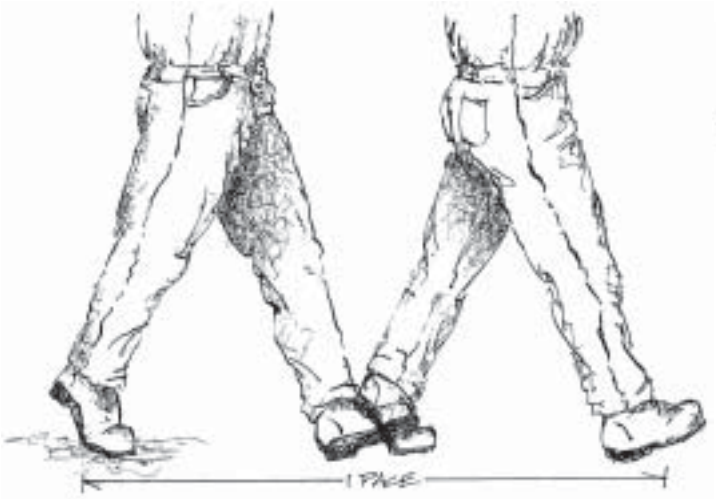
Determining your pace

Procedure

To reach a destination that lies somewhere along the bearing your participants are traveling, they need to know how far to travel. Otherwise, how will they know when they have reached their destination? They can tell how far they have traveled by counting paces. A pace is two steps, or every time the same foot hits the ground. For instance, if participants begin walking with their right foot, they should count a pace every time their left foot hits the ground.

When your participants travel a pace, they cover a certain distance along the ground. To determine what this distance is, mark off a distance of 100 feet using two sets of traffic safety cones or marker posts along a flat stretch of ground. Participants should count the number of **paces**, not steps, they travel in this 100-foot distance. Emphasize normal step sizes. Explain that variations can occur while running versus walking slowly and paces can vary with different terrain. The average number of paces in a 100-foot distance is about 20. The number of paces each participant takes will vary with their height, leg length and natural stride.

For each participant, divide 100 feet by the number of paces traveled to determine how many feet are in a pace for them. Round the number to the nearest whole number to make future calculations easier. This number will be useful later on during the orienteering course when participants will need to convert distances to paces. Have participants calculate their pace for uphill as well as downhill.



Activity E

Taking a compass bearing on an object

Procedure

Have participants take their compasses and face a selected object. Point the line of travel arrow directly at that object. Hold the compass in the palm of the hand, level, and at waist height. Next, have participants turn the compass housing until the blue north orienting arrow and the red (north) end of the magnetic needle are lined up. Have participants read the number where the index mark meets the degrees marked on the compass dial. This is the bearing of the object; it is given in degrees from magnetic north.

Take 12 paper plates, and with a large-nibbed marking pen, draw an arrow on each plate and write down an object that your arrow points to. Lay out the paper plates, weighted with rocks, in a flat area and orient the arrows to the object you select for that station such as a flagpole, picnic table, fire hydrant, chimney, or tree. Ask participants to visit each arrow and take a bearing on the object identified. Check their results against bearings taken by you.

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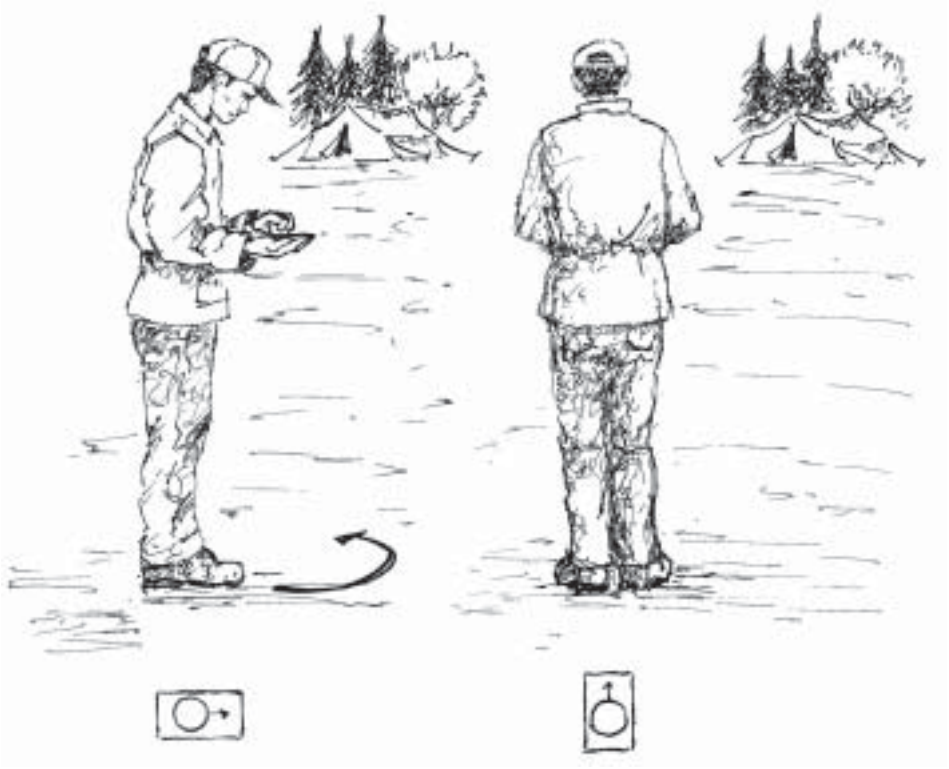
Activity F

Following a bearing

Procedure

Ask participants to follow a bearing of 140°. They should turn their compass housing until 140° is lined up with the index marker or line of travel arrow. Next, your participants should hold the compass flat, close to the waist and in the palm of one hand. They should keep the base plate firmly against the abdomen, with the direction of travel arrow pointing perpendicular to the body and directly away from them. They need only look straight down to see the compass.

Holding the compass in this manner, after the bearing has been dialed, participants should rotate their *bodies* using their *feet only* until the red north end of the floating magnetic needle lines up exactly inside the blue orienting arrow. "Put red Fred in the blue shed" is a humorous phrase that can help them remember this. Participants should resist the temptation to move the compass by pivoting the wrist to get the needle to line up with the orienting arrow. They should *move only their feet*. The line of travel arrow should now point to 140°.



Now have the participants look up and choose a distant landmark that is directly in line with the line of travel arrow and bearing. To pick out a distant landmark, participants should look straight down at the compass then look straight ahead. Each participant should do this several times quickly until a tree, rock or other object keeps presenting itself every time he or she looks up from the compass. This object has now become an extension of the bearing.

It is essential for hunters to follow a bearing along the ground by picking out distant objects and traveling to them. This process of picking out and traveling to distant landmarks is typically done several times in the process of following a bearing in the field until the destination is reached. It is important for hunters to keep in mind that the compass only serves to orient the user to the proper bearing and aid them in picking out a distant landmark. Once the landmark has been selected, the hunter should temporarily ignore the compass and travel to the landmark for the required distance.

Test your participants' abilities to walk a compass bearing. Have each pair of participants follow an imaginary triangle. Each angle within a triangle of equal sides equals 120°.

1. Have them place a marker, such as a stone or other visual marker, at their feet.
2. Select a number between 0 and 120.
3. Dial this compass bearing on their compass.
4. Walk 15 steps following this bearing.
5. Add 120 to the selected bearing.
6. Walk another 15 steps using this new bearing.
7. Add 120 to your second bearing.
8. Walk another 15 steps using this new bearing.
9. Participants should end up at their marker.

Station 22

Sense of Place

Activity G

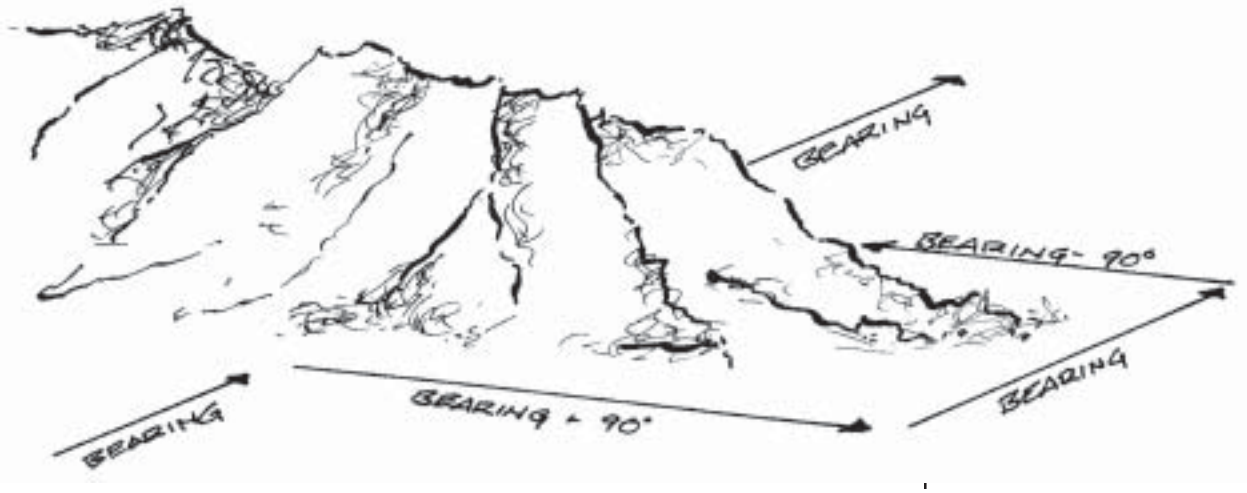
Traveling around large obstacles

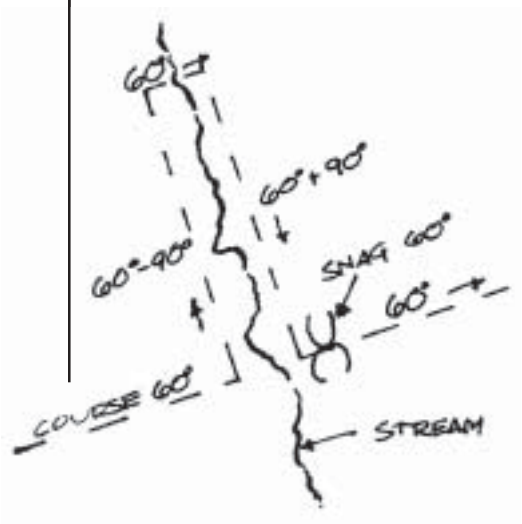
Procedure

On a cross-country hike, hunters may encounter obstacles such as a lake, a swamp, a cliff or a pond in their path of travel. If they can't walk through or over the obstacle, they'll have to walk around it.

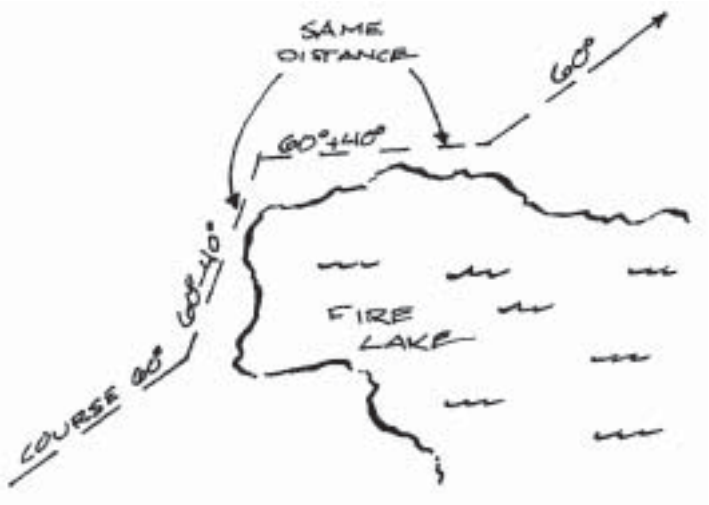
If hunters can see across or through an obstacle, it's a comparatively simple matter. They should first locate a prominent landmark on the other side of the obstacle, such as a large tree or rock formation. Walk to it around the obstacle and take the next bearing from there. Before setting out again, they should make certain they are on the right track by taking a "back-reading" – looking back toward the point from which they came. That point should be directly behind them.

Sometimes hunters can't see across the obstacle to find a distinctive landmark. A technique – called the **off-bearing technique** – allows one to travel around such large obstacles as steep hills or cliffs. To demonstrate this technique, use a building as the obstacle. Give participants a bearing that would cause them to travel from their present location to the near side of the building. They should travel that bearing to the building. Note that they cannot see the other side and they cannot continue on that bearing up and over the building. So, at the building, they should take an off-bearing of 90° from the original bearing and pace off sufficient distance on the new course to get clear of the obstacle. It is important for them to count their paces. Once they are beyond



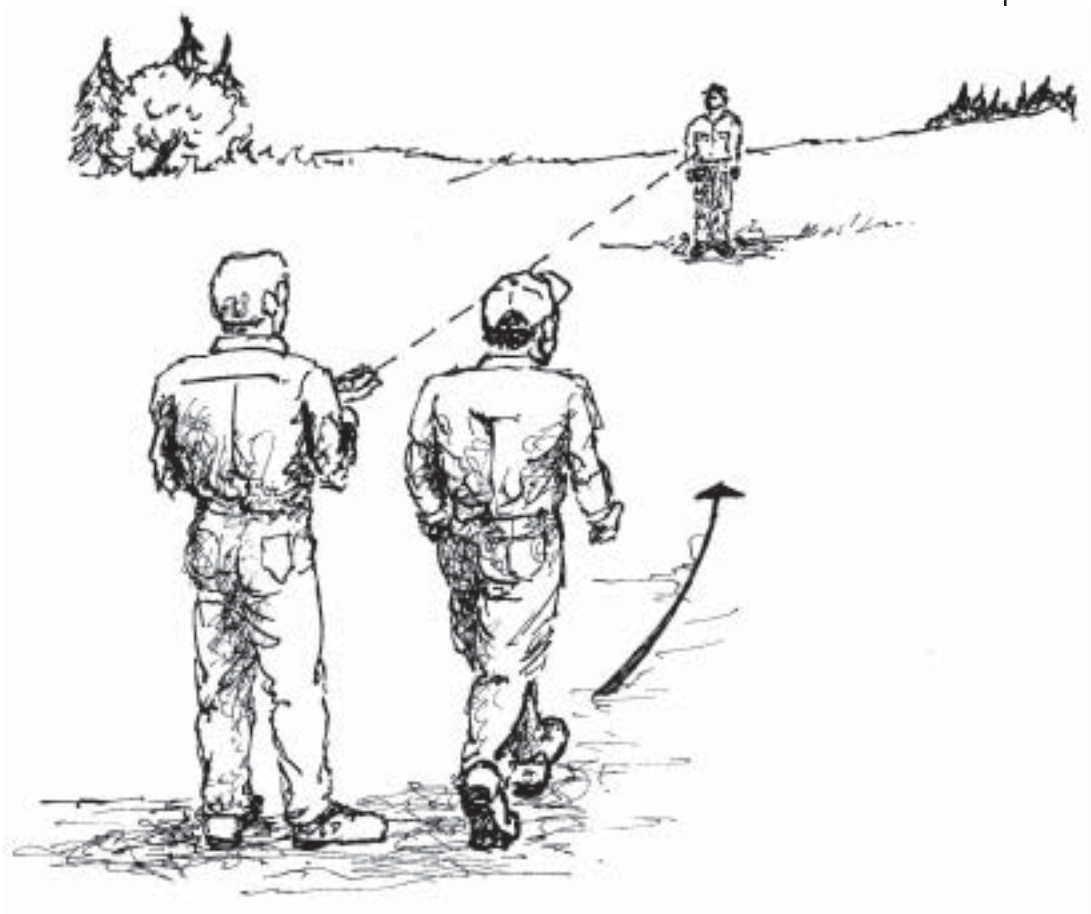


the building, they should then re-dial to the original bearing and travel that bearing until they are past the obstacle. They do not need to count paces during this leg of the trip. Once past the building obstacle, they should reverse the bearing by 90° and pace back the distance covered when they first went 90° off the original course. They should count as many paces going in this reverse direction as they did when they first went off the original bearing.



Another technique that works well in traveling around obstacles, especially when no distant object is in sight, is called ***"bird-dogging."*** This technique requires that hunters work in pairs. The person with the compass will orient to the appropriate bearing. This "navigator" will send the "bird dog" ahead, pointing out the general direction to travel. Before the navigator loses sight of the "bird dog" he or she will shout at the "bird dog" to stop. At that point, the navigator will instruct the "bird dog" to move to the right or left until the "bird dog" is lined up exactly with the bearing. Instead of picking out a distant object, the navigator has created a distant object by using the "bird dog."

Remind participants that when they reach a distant object or their "bird dog," they must either stand with their backs against the object or plant their feet exactly where the bird dog is standing. In this manner, the navigator always stays exactly along the bearing and not to the left or right. If little attention is paid to staying along the bearing, the destination may never be reached, especially if the distance to be traveled is extensive.



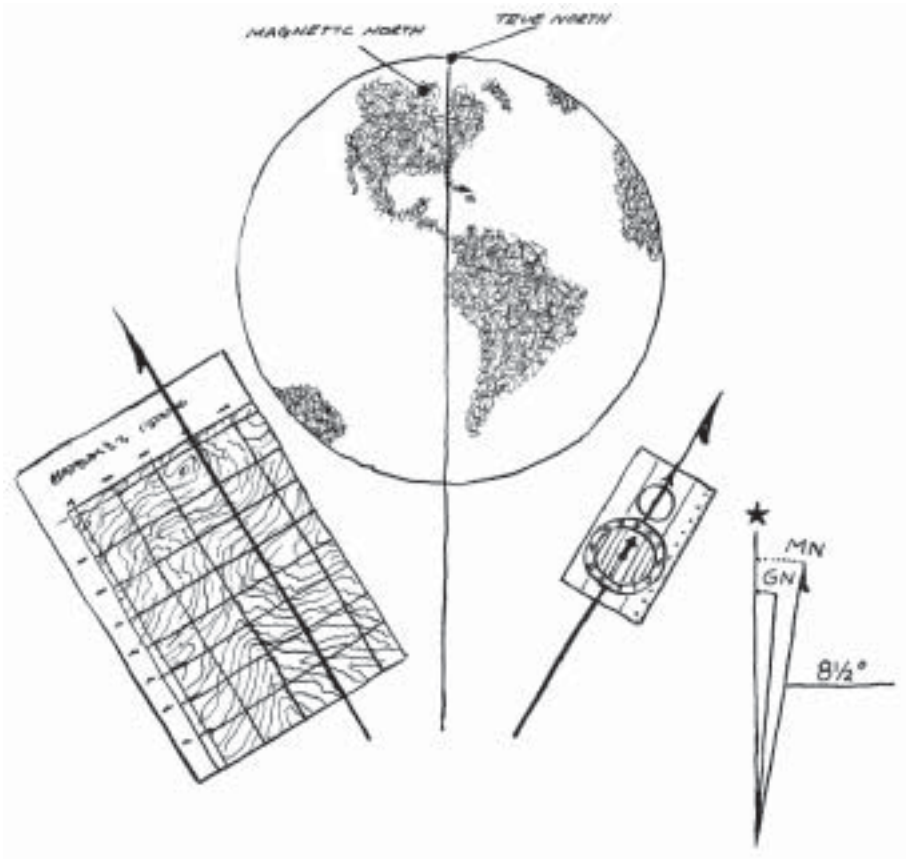
Activity H

Using map and compass together

Procedure

Maps can be used alone to help a hunter navigate through the wilds. And compasses can be used alone to do the same. But when used together, as a set, the two items prove to be more powerful and accurate than either used alone. Before using map and compass together, it is important to understand the limitations of each.

One important limitation is that the compass needle always orients itself according to Earth's magnetic field and points to the magnetic north pole, not to true, geographic north—the north polar axis about which the Earth turns. Maps, however, are drawn according to true, geographic north. The two poles do not coincide. The Earth's magnetic north pole lies about 1400 miles south of the true geographic North Pole in upper Hudson Bay, Canada. It's exact location changes not only annually,



but also daily. Over the last century and a half, the magnetic north pole has tended to move in a northwest direction about 10-15 km each year. In 1831 the North Pole was located on the west coast of Boothia Peninsula, Canada. By 1948, it was located at Allen Lake on Prince of Wales Island. This new point represented a distance change of 250 km. In 1994, the magnetic north pole was discovered to have been located on the Noice Peninsula, on Ellef Ringnes Island.

Therefore, in most places in the U.S., the compass does not point to true north. Only one narrow strip of land exists where the compass points to true north. This strip of land, or "zero line," runs from Lake Superior, through Wisconsin and down to western Florida. If hunting anywhere between this line and the east coast of the United States, the hunter's compass needle will point west of true, geographic north. If hunting west of the zero line to the Pacific Coast, the compass needle will be pulled to the east of true north. The compass needle can be "pulled" as much as 20° westerly in Maine or 30° easterly in Alaska.

This difference between the language of the map and the language of the compass is extremely important to any hunter using a map and compass together. If a hunter is out west in an area where the compass points 14° east of true north, then the hunter who doesn't compensate for this error can stray a quarter of a mile for every mile hiked. If the hunter makes the correction, but makes it in the wrong direction, then the error would be doubled and the hunter would go astray one half a mile for every mile hiked. This could lead to very serious and dangerous survival situations.

Make it clear to your participants that it is important for them, when traveling with map and compass, to understand

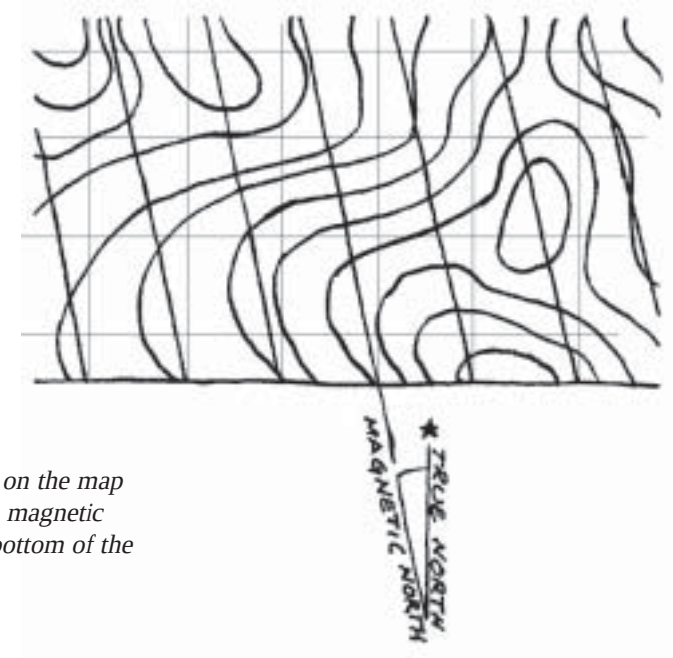
- ❑ an error exists
- ❑ which way the error lies, east or west
- ❑ to what degree the error exists and
- ❑ how to correct for this error.

One way to correct for this error is to make the *compass agree with the map*. In this case, a hunter needs to reset the compass each time he or she takes a direction from the map. The upcoming activity *Correcting the Compass for the Difference between Geographic North and Magnetic North* demonstrates how this works.

Anyone situated to the east or west of the zero line needs to understand that his or her compass needle will not point to true north.

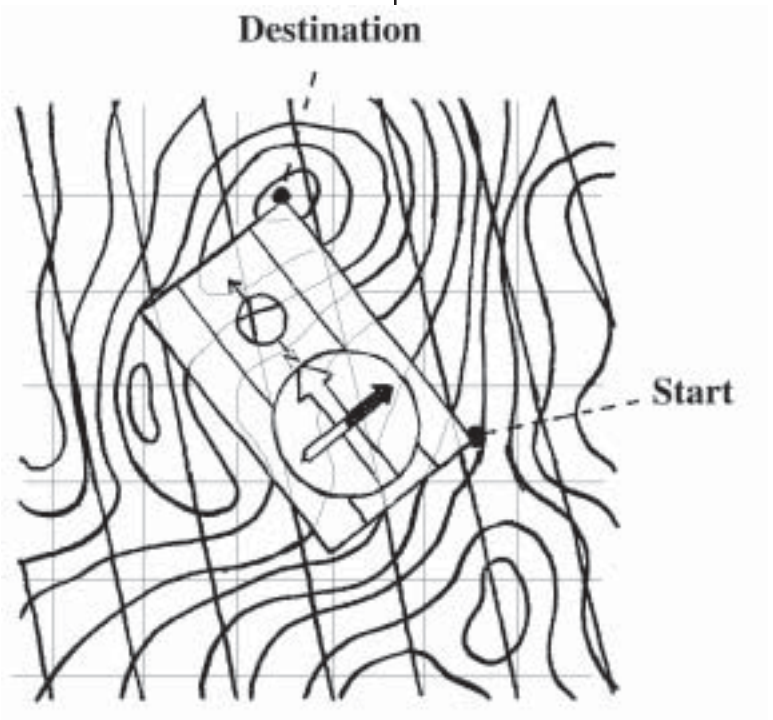
A much simpler way is to make the *map agree with the compass* at all times. This requires a person to mark magnetic north lines on the topographic map and to ignore the geographical grid lines that come printed on the map. To do this, ask pairs of participants to place their maps before them, face up. Tell them that almost always, north is at the top of the map, south is at the bottom, west is to the left margin and east is to the right margin.

Ask them to locate the magnetic north half-arrow in the bottom margin of the topographic map. With a long ruler, T-square or other straightedge, draw a line following the half-arrow up through the map. Then draw other, parallel lines, two inches apart. Space them evenly over the entire surface of the map.



Draw in a series of lines on the map that are parallel with the magnetic north half arrow at the bottom of the map page.

Now, to take a map bearing, participants should mark their starting point and destination with a light pencil mark. Then draw a line connecting these points. Next, line up the long edge of the compass with the route so that the direction of travel arrow points in the direction the participants want to hike.



Holding the compass firmly in place, participants should rotate the compass housing until the orienting arrow and orienting lines are aligned parallel with the north-south magnetic lines they just drew in. The number at the index mark on the compass--in this example, it is 330°--is the bearing they should follow in the field. Hunters may follow any bearing taken from their map using this procedure without having to compensate for declination. The newly drawn north-south magnetic lines have made all the adding and subtracting of declinations unnecessary.

Correcting the Compass for the Difference between Geographic North and Magnetic North

When a hunter uses a compass with a map to get a bearing on a landmark, this procedure is called taking a ***map bearing,*** a ***grid bearing*** or a ***true bearing***. A problem arises, as explained above, since maps are oriented to true north (or the North Pole) but the compass points to magnetic north located about 1400 miles south of true north. Since in most locations in the United States, the magnetic pole pulls the compass needle off from true north, an adjustment needs to be made to allow for this angle of *declination.*

Declination means the amount that a compass needle declines from pointing true north in a particular place. It is the difference in degrees between true north and magnetic north. Declination is not negligible and should not be ignored. For instance, if a hunter travels 5 miles in Colorado and ignores the declination of 14.5° east, the hunter will be 1.25 miles off the intended route, enough to get thoroughly lost. Hunters can find the direction of the earth's magnetic field—or declination—in their hunting area by looking along the bottom margin of their topographic map.

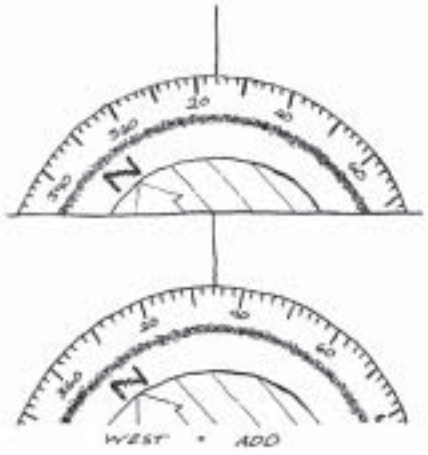
The true bearing must be converted into the declination-adjusted *compass bearing* before the hunter can follow the compass in the field. This is especially important if there is considerable declination in the area or if accuracy is quite important. With one turn of the dial hunters can make the proper allowance for any declination. Here's how:

First, ask participants to look at their topo maps and find out the angle of declination in your area. The declination or magnetic variation is usually printed at the bottom of the map. In Wisconsin, angles of declination vary from 2° west (in the northern tip of Door County) to 3° east (in Hudson, WI).

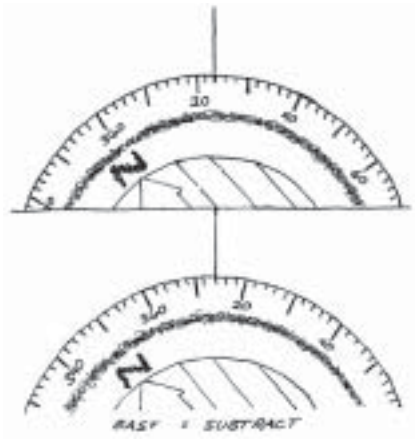
Second, ask participants to turn their compass dials according to the following rules:

From Map to Field:

Westerly declination – ADD (turn dial west)



Easterly declination –
SUBTRACT (turn dial east)



Here are a couple of sayings to help participants remember whether to add or subtract the declination:

"East is least."
"West is best."

In order for a hunter to follow a bearing taken from a map with a compass, the hunter must subtract easterly declination and add westerly declination. If a hunter were in Colorado, the hunter needs to subtract 14.5° from the map bearing (true bearing or grid bearing), because the compass needle points 14.5° east of true north. Subtracting compensates for the easterly error. Hunters hunting in the eastern United States, where compasses point west of true north, must correct the map bearing by adding the appropriate declination number.

As a final example, if a hunter takes a map bearing of 24°, but the declination is 10° west, then the hunter must turn the dial west 10° (add 10°). The compass bearing will then read 34°. If the declination were 10° east, the hunter would have to turn the dial east 10° or subtract 10° and the compass bearing will then read 14°.

Note: ***When taking a bearing in the field and then transferring that information to the map, the rules of subtracting or adding declination are just the opposite of those above. Participants would have to follow the rules outlined below.***

From Field to Map:

Westerly declination –
SUBTRACT (turn dial east)

Easterly declination –
ADD (turn dial west)

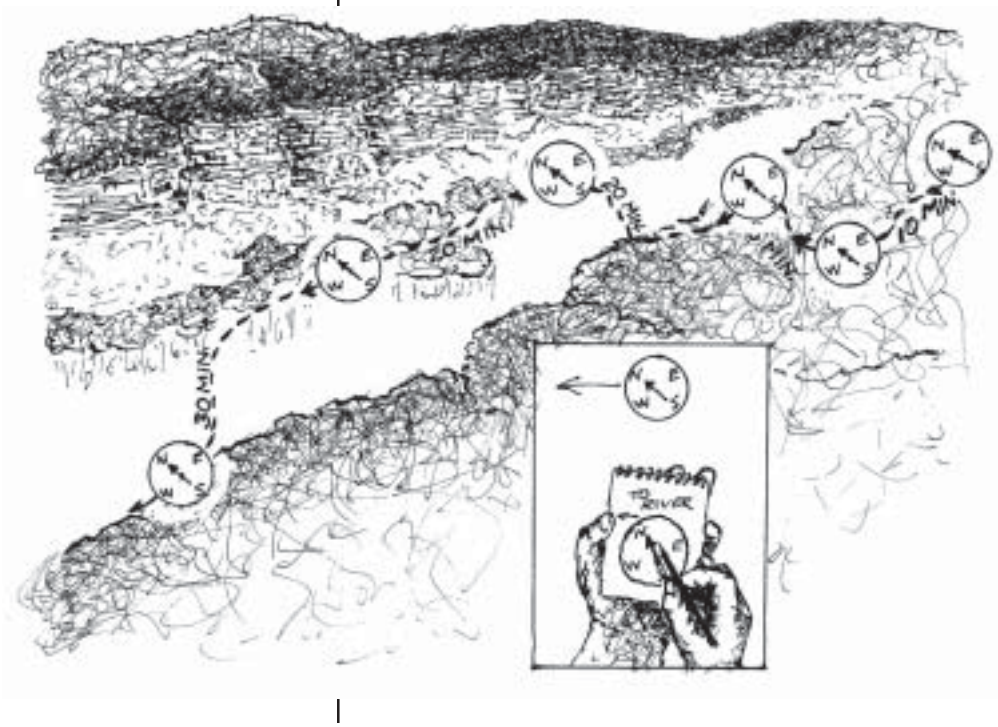
Activity I

Using a compass without a map

Procedure

Most Wisconsin hunters don't carry a topographic map of the place in which they plan to hunt. Nevertheless, places like the Chequamegon or Nicolet National Forests have vast, unbroken expanses of forest where it is easy, and potentially dangerous, to get lost. Deer hunters not paying attention to where they are walking while tracking a wounded deer could easily get disoriented on an overcast day. And when that overcast sky begins to snow, the threat of hypothermia is very real.

So, how can hunters find their way in the woods without using a topographic map? First, all they need is a long, linear landmark such as a forest road, a hunting trail, a stream, or even a ridge. Before setting off into the Wisconsin north woods without a trail to follow, they should turn around and face the roadway or trail they were on, before losing sight of it. They should be at least 30 feet away from a car, because its metal affects the way the compass needle will spin.



The hunters should hold the compass steady in front of them, with the direction of travel arrow pointed at the road. When the needle settles, they should turn the compass so the orienting arrow lines up with the north (red) end of the needle, and note the number of degrees marked at the index mark. To help them remember this, they should write down

the number of degrees and sketch the compass face and draw an arrow pointing toward the road. Now, they can hunt away from the road, noting which way they're heading via the compass. Each time they head off in another direction, they should take another compass reading facing the point of ground from which they turned. Write that compass bearing down and preferably sketch a map of the route as they go. In addition to direction, they should note how much time it takes to travel between the points where they change direction. This assumes a steady rate of walking…with no time lapsing due to standing or resting.

When it's time to head back, the hunters can take out their compass and note pad and follow the bearings back to their starting point. They should follow the direction of travel arrow while keeping the red end of the needle aligned with the pointed end of the orienting arrow. They should then backtrack in this manner for the same amount of time that it took them to walk *to* their current location. They need to keep in mind that traveling uphill takes longer than traveling downhill. When they reach the spot where they changed direction, they should then reset their next and continue backtracking.

For the last bearing, they should employ the technique of *deliberate error*, which means intentionally aiming to one side of their starting point. That way, when they arrive at the baseline, they will know which way to turn to reach the starting point. So, on the last leg home, instead of dialing their first bearing, say 75°, they should dial the bearing plus 10°. That way, they'll know to turn and hike left along the road or path to reach their destination, because they deliberately set their last course to be 10° to the right of their car. An offset of 10° for a one-mile course is reasonable. For longer routes, the deviation should be a bit smaller.

When using a linear baseline, hunters should make certain it is long enough in relation to the distance they plan on hiking into the woods from the baseline. The baseline should also run more or less perpendicular to the route they are planning on traveling. A one-mile trail is adequate for a day's jaunt through the woods, but it is too short for a three-day trek into the wilderness. In that case, a three to five or ten-mile road may be more adequate.

Tell participants that before they attempt this exercise on their own, they should practice in familiar country with a partner until they are absolutely certain they can find their way with this method. It's always best not to wander too far or make too many turns when leaving a road, path or stream.

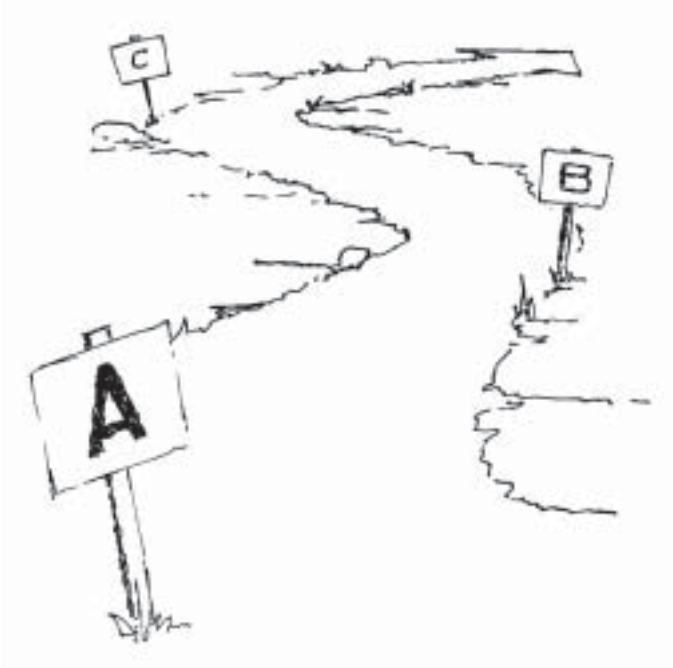
Activity J

Orienteering

Procedure

Setting up an Orienteering Course

Orienteering is a fun activity that tests a person's understanding of the correct use of map and compass, or of a compass alone. An orienteering course requires that the entire route of travel be laid out before the group arrives. The predetermined course must follow exact compass bearings and use specific objects (forked tree, fence post, etc.) or marked points. Distances between these points must be measured prior to your group's arrival.



Select a safe area to run the course. Different seasons have different advantages. In fall or early spring, leaf cover is minimal and makes navigating easier. In summer, be wary of poison ivy and yellow jacket nests. Stay away from areas with prickly ash, multiflora rose, and steep or otherwise hazardous terrain.

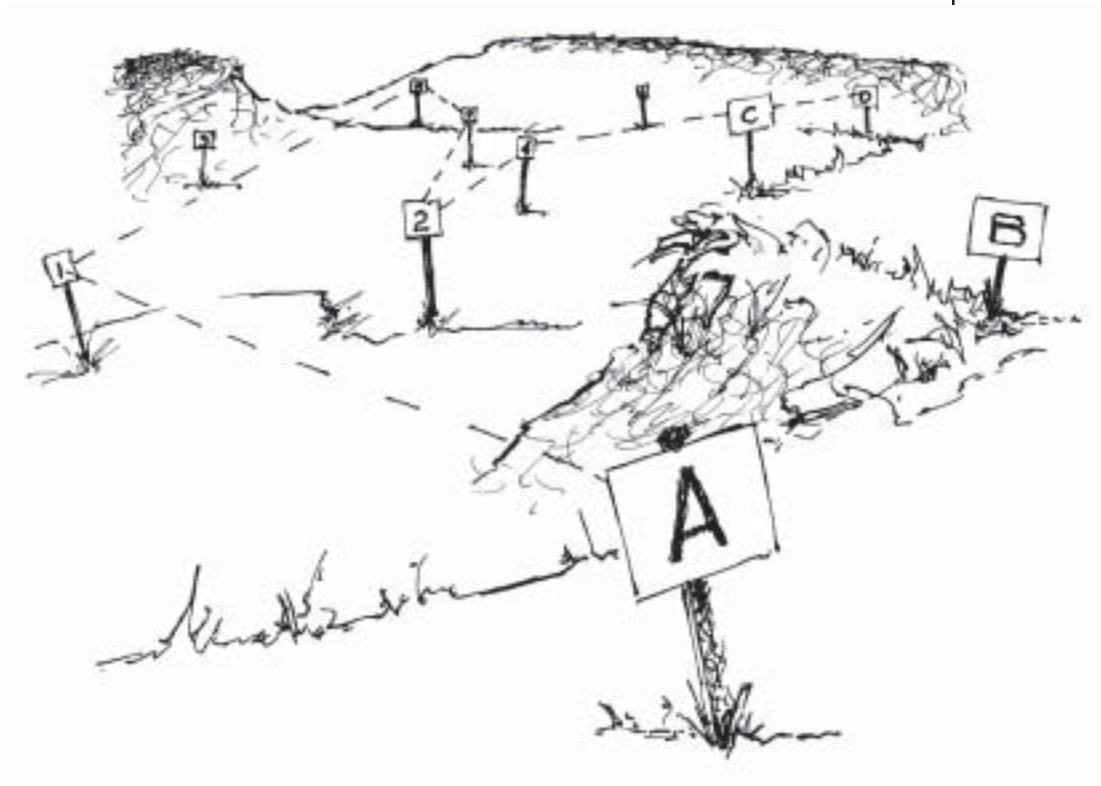
If you run these courses more than a few times a year, avoid excessive abuse to the vegetation by relocating the course to another area. By periodically changing the area of the course, you will keep it challenging. If left in one area too long, a course can become heavily worn with footpaths, defeating the whole purpose of navigating through "wild lands." Permanent courses can be considered if the intent is to run the course only a few times a year.

If possible, begin your course's starting stations along a trail or path. You will need to establish several starting points along this path. Starting all participants out at the same spot will cause a traffic jam of people waiting their turn to get started, so you should establish several starting stations spaced evenly along the trail. Mark the stations with flagging or posts, and label them A, B, C, etc. If you have enough room, space the starting stations 50 feet apart.

Now, with a partner, set up a network of interior station markers that the participants will follow. Number each of these station markers; numerical order is not necessary. Take a compass, pencil, graph paper, clipboard and a few station markers in hand and go out into the designated area. Once you have placed a station marker, take a compass bearing from your station to your partner's station. If your partner is visible, then a visual bearing can be taken. If your partner's station is not visible, yell back and forth "over here" using your voices to establish a bearing.

Take a bearing by pointing the direction of travel arrow at the visible marker or voice sound. Holding the base plate with the direction of travel arrow still pointing at the marker, turn the compass dial so that the red (north) end of the magnetic needle lines up inside the orienting arrow located inside the compass housing. Read the compass bearing at the index marker.

Yell the bearing you are getting back and forth to one another until your bearings are as close to 180° apart as possible. For example, if you take a compass bearing of 32° from station 1 to station 2, your partner should have a bearing of 32° + 180° or 212° from station 2 to station 1. Think of yourselves being located on the opposite side of a circle from each other. You are 180° apart. You now have two bearings to work with. Next, determine the



distance between stations 1 and 2. Pace off the distance from one post to the other using your compass bearing to keep you on line.

Begin making a rough map of where station markers are in relation to each other by plotting the markers on graph paper complete with established bearings and distances. You can get as precise as you want. You may wish to establish a scale for your map to correspond with the actual distances traveled from marker to marker. You can also use a protractor to plot out bearings (angles) of station markers in relation to each other. You will use the information on this rough map to establish various compass course routes for the participants.

Repeat the instructions above for putting out additional station markers and determining bearings and distances until you have established a network among the station markers. For example, from station 1, you might take bearings off of three different markers and likewise for station 2. Use your own judgment to determine the number of station markers to put out. You will need enough markers to create several different routes for the participants and to avoid bottlenecks at station markers.

Next, shoot a compass bearing from each starting station to a different interior marker. Plot these on your rough map. These bearings will guide students to the first station marker. Your fieldwork is now complete.

Creating Orienteering Course Routes

Decide how many station markers each participant should find. A maximum of four or five stations is recommended for a two-hour program, which includes about an hour of instruction on how to use the compass. Use your rough map to plot as many routes as you feel you will need to accommodate the size of the group. Participants should work in pairs. If you anticipate 20 participants and they work in pairs you will need 10 different courses and 10 starting stations. A course route would be something like: Station A to 5 to 2 to 10 to Station C. The participants will successfully complete a route if you start them at a station marker along the trail and they end at a station marker on the trail. This also ensures that students won't get lost trying to find their way back at the end of their course.

Running the Orienteering Course

Break the group into pairs and assign each pair a different compass route. Each group should have a clipboard, pencil, worksheet (see attached) with the compass route instructions, and at least one compass. Have the group convert distances to paces and explain to them the procedure for following the route. For example, a girl on the orienteering compass course has an orienteering worksheet that says she must travel a certain bearing for a distance of 200 feet. She earlier determined that she travels 5 feet per pace. She can either count off her paces in multiples of 5 until she reaches the 200 foot mark, or she can divide 200 feet by 5 feet per pace, then travel 40 paces to reach her destination. It's a lot easier to count to 40 than it is to count in multiples of 5.

It may be helpful, especially if you have limited assistance, to tell each group the first station marker they should find if they start at the correct starting point and travel the appropriate bearing and distance. This lets them know right away if they are doing something wrong. If they get it wrong, they can start over and correct their mistake. If they get it right, this builds their confidence and they can continue to the next station.

It is very important for you to walk around in the area and check in on the groups occasionally to see how they are doing. Keep in mind this is probably the first time they have handled a compass and followed a course, and they are likely to be confused.

At the end of the course, check each group to see if they found the correct station markers.

End of Teaching Station

Orienteering Worksheet

Station A Team:
Names:_____

Starting at Line # 1 below, enter your starting station letter. Read across the line to determine the bearing you should take from your starting station.

Then read the next number to determine how far you need to travel to the next station.
You should convert the feet to number of paces.

When you arrive at your next station, record the post number in the space beginning on the next line.

Continue to find all stations. If you follow the instructions correctly, you should end up in the general area where you started.

	Compass Bearing in Degrees	Distance in Feet	No. of Your Paces
1. Start A	156°	190	
2. Post	197°	435	
3. Post	55°	125	
4. Post	46°	425	
5. Post	320°	250	
6. End			

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